

INTELLIGENT LED TRAFFIC SIGNALS MODULES

This application claims the benefit of US Provisional Application 60/442082 filed January 23, 2003 entitled "Intelligent LED Traffic Signals Modules".

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BACKGROUND OF THE INVENTION

Field Of The Invention

10 The present invention relates to traffic signals, more specifically it relates to light emitting diode traffic signals.

Description of Related Art

15 Technology of light emitting diode (LED) traffic signals is well established and in use worldwide. Most LED traffic signals usage is for retrofit on existing traffic controllers. The controller turns traffic signals on and off through load switches and detects signal integrity through conflict monitoring (North America) or through current monitoring (Europe, Asia, Australia). These features were intended for incandescent lamp based systems. The present invention comprises an intelligent LED module, able to receive control signals and gives a status on several LED signal vital parameters, paving the way 20 for a next generation of simpler and safer traffic controllers.

SUMMARY OF THE INVENTION

25 The present invention relates to an intelligent LED module for an LED traffic signal. The inventive module is able to receive control signals. The control signals may include one or more of the following control signals: on, off, dimming, flashing and/or emergency disconnect. The use of control signals eliminates the need for several separate modules in the controller. Additionally, the intelligent LED module provides feedback to the controller on several status indicators.

30 **Brief Description of the Drawings**

Figure 1 is an overview of the intelligent LED traffic signal module.

Figure 2 is a block diagram of the intelligent LED traffic signal module.

Detailed Description of the Invention

35 A general overview of the inventive LED traffic signal is shown in figure 1. The LED signal is connected to a non-switched voltage source 22. Voltage is permanently applied to the signal. Preferably, the signal can receive four control signals 30. Preferably, the control signals are on/off 16, dimming 12, flashing 18 and emergency disconnect 14. The 'on'

control signal 16 turns the LED signal on, eliminating the need for a load switch. The 'dimming' control signal 12 dims the light output to pre-established level (used in conjunction with 'on' signal), eliminating the need for special dimming modules in the controller. The 'flashing' control signal 18 puts the signal in flashing mode, eliminating 5 the need for controller flasher modules. The 'emergency disconnect' control signal 14 is used in case the LED signals does not respond to the off control signal 16. It results in a permanent open signal.

10 The intelligent LED module can provide feedback about the signal's status to the controller. Light output status 10 is given by a photocell mounted in the LED signal adjacent to the LEDs. This provides an indication if the signal is approaching a pre-defined end of life threshold due to normal LED light output degradation. The current 6 flowing through the LEDs as well as the LED array voltage 8 gives the electrical status of the LED array. These parameters are used in conjunction with the light output status 10 15 to validate that the power supply 24 is functioning normally. Input voltage 2 is an indication of normal supply voltage 22. Input current 4 is an indication that input signal current is normal. These two status signals are used to validate power supply status.

20 Referring to figure 2, a block diagram of the functions of the LED module is shown. The electronic switch 34 consists in an on/off switch controlled by the on/off command 16. The electronic switch 34 preferably is an opto triac switch. Other known switches may also be used. The emergency disconnect will blow an input fuse by shorting the supply line. This may be accomplished through a transistor or other device. Input and output voltage 2 are monitored. Input current 4 and output current 6 are sensed. The output 25 voltage 8 is preferably monitored by a resistor divider. Other monitoring circuitry may be used. Preferably, the input current 4 is sensed by a resistor or current transformer.

30 The integrated flasher 36 comprises a timer circuit switching on and off the electronic switch at a pre-determined flashing rate. When the command signal disables it, this circuit is by-passed. When no flashing signal is received, the flasher is always on.

The dimming command 12 can be on/off, linear or pulse width modulation (PWM). The dimming interface 28 decodes the dimming command and scales down the power converter feedback loop accordingly.

35 The LED array 26 feeds back the following information: light output status 10; LED current status 6; and LED voltage 8. Preferably, the light output status 10 is provided by a photodiode. Alternative means of providing the light output status 10 may be used.

Preferably, the LED current status 6 is given by the voltage across a resistor in series with the LEDs. Preferably, the LED voltage status 8 is given by the voltage across the LEDs through a voltage divider.